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SOLAS CONVENTION

Safety on Board

Degree Programme in Nautical Engineering

2018

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Degree Programme in Nautical Engineering
May 2018
Number of pages:
Appendices:

Keywords: SOLAS convention, safety on board, security, globalization

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This final project was dedicated to study some of the agreements that the International Maritime Organization approved over the past years. Concretely I decided to focus my efforts on the SOLAS conventions, all related with safety. I also tried to explain what the IMO was and how all its different organisms worked. It was essential and interesting to learn what an international organization meant, and therefore; understand how all the laws that were approved had a direct effect on the entire world fleet.

Since safety at sea is one of the most important issues related to the maritime sector, I thought that I needed to understand its evolution throughout the years. Because of different accidents that happened in the maritime world, a series of conventions were developed. After the sinking of the Titanic in 1912, a congress was organized in the United Kingdom to create the SOLAS. It covered and regulated the security on board of passenger ships and merchant marine. So, I asked myself, have all these measures worked?

The work method used all along the thesis, was analysing directly from the original texts of the IMO. By reading and summarizing the four SOLAS convention, I wrote the most important ideas that I considered. I checked the most part of the job that IMO did related to safety over the past years, and the goals for the future.

At the beginning, in 1914; the measures were really simple, and most of them were not even useful. Because of some historic facts like the sank of Titanic, the regulations became more strict and specific. Furthermore, technology and knowledge made a really high progress which allowed to make changes easily. The system established nowadays, is the result of these past years of work. However, our world is constantly evolving, and that is why organizations like IMO needs to be ready to face possible trouble

CONTENTS

1 INTRODUCTION

Since I was a child my motivation related to the marine world has never stopped growing. After four years studying in Barcelona at “Facultat de Nàutica de Barcelona” I have improved my knowledge and ambition related to this sector. During these months I have been capable of examine several conventions. The thesis is mainly based in SOLAS agreement. I combined and analysed the five versions of SOLAS, made over the lasts years we will understand the main differences between them. While new technologies were discovered they were also implemented to the ships to enhance their security. Safety navigation has always concerned to the world. IMO has been working to prevent possible accidents and disasters in the maritime sector. Thanks to the following pages we will be able to understand the way and the measures taken during the last years.

Human beings have a characteristic work method to make progress. Trial and error. As strange as it could sound, it is really effective. Thanks to all the people in the past, that have been experimenting and thinking about new ways to live we have a really evolved lifestyle. Since computers exist; we are progressing faster, more efficiently and in a more controlled way. The World is growing really fast over the last years, and of course marine sector takes an important paper since more than 90% of the goods are carried by ship.

The responsibility to manage the maritime sector falls into the International Maritime Organization and all his working bodies. They are in charge to regulate the maritime industry and take the appropriate measures. Flag states will form their legislation accordingly IMO’s regulatory work. Merchant and passenger ships are required to be under really strict rules to be able to navigate. Previous, annual and random inspections must be passed to get all the certificates in order. After accidents and mishaps had occurred the regulations became more concrete and specific. As an example, and because of the Prestige and Erika incidents; IMO brought a package of measures: Compensation limits

for oil pollution disasters were raised, mandatory ship-reporting systems, traffic and routing system were introduced;

Another important idea is to understand how a vessel is juridically treated. Nowadays, every ship needs a nationality. The State has authority over, and responsibility. By placing a ship on its register, a State assumes authority over the ship and undertakes the national and international responsibilities of a flag State in relation to that ship. As we are going to see in the incoming pages, the States are responsible of giving the certificates to the ships that fly their flag. That is why they are the first ones interested that the ship is in good conditions. If a ship does not have a nationality, it does not have any protection in international law and may be refused permission to enter foreign ports and engage commercial activities with other boats. (Özcayir 2004,7-9)

The truth is that having a ship navigating under your flag will benefit you, because the most part of the taxes are going to be paid to your State. However, it is a big responsibility since some kind of accident could occur to your vessel and therefore you will respond for it. This is the main reason of the existence of the flag of convenience. Some States offer some fiscal advantages and where the inspections are not that strict as in other countries. Some ship-owners choose to take some risks and pay lower taxes. (Özcayir 2004,10)

With all these ideas in our mind the following content of the Thesis will help you to understand how safety on the marine sector has improved, which are the main measures IMO has changed and which is the future of the safety.

2 IMO

The International Maritime Organization (IMO) is a specialized agency of the United Nations; it is mainly responsible for the safety and protection of international maritime transport. It also attempts that ships comply with certain regulations to prevent pollution. It is further responsible for propose and implement new regulations in order to control the maritime traffic. The idea of having an international regulatory body emerged in 1948, but it was not until 1959 that the founding countries met for the first time. Only countries can become a member of IMO, currently IMO is formed by 173 different State Members and three Associate Members. (Website of the International Maritime Organization)

Initially, IMO's objective was to develop international conventions because they wanted to regulate the world fleet about safety measures and pollution prevention. Although agreements are frequently updated, IMO focuses its efforts on trying to ensure that the regulations implemented are ratified by the great number of countries. Today practically 98% of the tonnage of the merchant fleet complies with all the regulations that have been developed.

It is important to understand that the IMO is not responsible about implementing the legislation; it simply adopts rules (standards). When a government of a country ratifies an IMO agreement, it undertakes to make it part of its own national legislation and therefore apply it like any other law. It is formed by the following organs:

- Assembly
- Council
- Maritime Safety Committee

2.1 The Maritime Safety Committee

Is responsible for proposing new safety rules or amendments to safety rules. It also examines issues related to navigation aids, shipbuilding, collision prevention, handling of dangerous cargoes, navigation records, investigation of marine casualties, rescue of goods and people or issues that directly affect maritime safety. It is the real body of work and is subdivided into committees. (Özçayir 2004, 42-44)

- Legal Committee
- Committee for the Protection of the Marine Environment
- Technical Competition Committee
- Facilitation Committee
- Auxiliary Organs

2.2 The Council

The Council is the executive organ of the IMO, and is responsible under the Assembly, for supervising the work of the Organizations. It is composed by 40 members elected by the Assembly. It must establish its internal regulations and coordinate the activities of the organs of the Organization. They have to meet with the frequency necessary for the proper performance of its functions. The council has to examine the projects and take charge of the reports and proposals presented by the different committees. It is also responsible for entering into agreements regarding relationships with other organizations.

2.3 The Assembly

The assembly is the highest governing and technical body of the Organization. All the country members are represented, and they meet every two years in regular sessions. The main functions of the assembly would be the following. (Özçayir 2004, 37-41)

- Establish an internal regulation

- Constitute auxiliary bodies
- Take charge of the reports that the Council presents and examine them
- Approve the work program of the organization
- Put the budget to a vote
- Decide when they meet

These are the tree main bodies of the IMO, however; depending the kind of job and legislation they have to work in it is possible to establish subsidiary bodies. The Legal Committee (Established because the Torrey Canyon incident), Marine Environment and Protection Committee (Established in 1985), Technical Co-operation Committee (Established as a subsidiary body of the Council), Facilitation Committee (Established in 1972) and the Secretariat (headquarters of the Organization in London).

What all of its agencies seek is to create an equal space in the world so that ship-owners have several options to solve their financial problems. Maritime transport is a truly internationalized sector and can only function effectively if its regulations and rules are agreed, adopted and applied internationally as well. The IMO is in charge of controlling and improving this whole process. It will deal in the maritime field with everything related to projects, construction, equipment, equipping, and operation and scrapping of ships in order to guarantee that this sector, which the world needs; be safe, ecological, efficient and protected.

The main priorities of the IMO in the coming years is to improve energy efficiency to achieve a more ecological and sustainable world. For this, they have organized a series of strategic principles: (Özçayir 2004, 46-47)

1. Work in that the implemented rules are fulfilled in an effective and efficient way
2. Integrate new technologies adapting them so they are not too expensive for ship-owners
3. Develop real solutions for maritime transport to reduce air pollution
4. Participate in processes that regulate the control and use of the oceans

5. Reduce the amount of documentation that a ship needs to entry and exit a port
6. Ensure regulatory efficiency by compiling data more efficiently
7. Guarantee the organizational effectiveness of the member states, organizations, the secretariat…

Nowadays more than the 90% of the cargo transported in the world is made by ships. The maritime sector represents the most efficient and profitable way of transport for most of the products. It is considered the cheapest in relation to quantity of cargo and displacement and it is also very safe. It is able to connect two cities far from the world in a reasonable time.

The IMO has not always been so farsighted. At first, they acted after a disgrace occurred. They started to think about a possible agreement that would regulate the safety of ships after the Titanic accident in 1912. So, they had a meeting and after two years presented the SOLAS (Safety of Life at Sea). The same happened when they presented the MARPOL (International Convention for the Prevention of Pollution from Ships) due to the sinking of the Torrey Canyon. The impact caused by the oil spill in the environment meant that a new prevention agreement was needed to replace the current OILPOL (International Convention for the Prevention of Pollution of the Sea by Oil). By explaining the Titanic accident in particular, it will be possible to understand what meant for the world. The SOLAS convention created due all the catastrophes that occurred, will be analysed.

3 TITANIC:

The sinking of the Titanic in 1912 shocked much of the world. From then on, the safety measures available to the ships were thoroughly studied and modified to a large extent. The ship Titanic was a British liner, the largest ship in the world at the end of its construction. During his maiden voyage he collided with an iceberg and hundreds of people lost their lives. He left the port of Southampton for New York, but he stayed halfway.

Its construction lasted 3 years and was carried out at the Belfast shipyard called Harland and Wolff. The ship was designed with the latest contemporary technology to provide the ultimate in luxury and comfort. But the safety measures were not enough to accommodate so much passage, and only carried lifeboats for half the passengers. When the accident occurred, water began to enter the bow of the vessel and passengers were evacuated in the lifeboats. 710 people survived, mostly women and children; the others died of hypothermia or drowned in the sea. Subsequent investigations by the United Kingdom and the United States showed that a large number of errors had been committed. For these reasons led to the creation of the SOLAS agreement, Safety of Life at Sea. (Website National Geographic 2017)

The company International Mercantile Marine Company with J.P. Morgan at the front financed the construction of the ship with an approximate cost of 7.5 Million dollars of the time. Approximately 170 million dollars would be current.

The ships are divided into bulkheads, wooden or metal constructions that generate different closed compartments in the ship. Really how many more bulkheads a ship has, the easier it is to control a fire or a waterway since you can isolate it. The Titanic had fifteen bulkheads or partitions that insulated the ship. Due to the strong collision with the iceberg, the first five were flooded causing the ship to sink by the bow. As the other bulkheads above the waterline were not high enough, the water began to move forward filling the ones on the sides. Bulkheads were built just 3.4 meters higher than the waterline. So little by little the ship was sinking. This was one of the biggest construction errors of the

Titanic. If the bulkheads had been built as they are today, the ship would not have sunk. (Ballard 1987, 40-45)

The ship had a double bottom of at least 1.6 meters where ballast water could be stored to improve buoyancy. What they didn't add to the construction was the double hull, as it turned out to be very expensive. Although the ship was built with the latest security measures and naval construction techniques, its design was not revolutionary.

Since the terrible accident that occurred on July 30, 1912 due to the direct shock with an iceberg, the United Kingdom committee established 24 recommendations on:

- Design of ships
- Lifeboats
- Life jackets
- Signaling devices
- Wireless transmission poles

In 1914, the first Convention on the Safety of Life in the Sea was convened in London, which adopted the first international agreement, SOLAS. With the aim of avoiding a second accident like the one that occurred.

The agreement deals and regulates about safety at sea on board ships. The main changes and most important measures on the convention are the following: (Website ResearchGate)

- Cruise ships are required to have rescue boats with a capacity of 25% greater than the number of people on board.
- Vessels are obliged to organize radio guard shifts during all hours of navigation.
- He is obliged to carry out periodic practices with lifeboats so that the crew knows in depth the protocol to follow.
- International monitoring of polar icebergs movements.
- Currently ships must be equipped with radar and have satellite access to meteorological report.

4 ANALYZING THE SOLAS CONVENTIONS

Throughout history the SOLAS agreement has been modified. As new technologies appeared, they tried to implement. Therefore, we have several treaties to review. Convention are presented chronologically.

4.1 International Convention for the Safety of Life at Sea 1929

The first treaty, as already mentioned, occurred in 1929. The IMO was not yet formed, so it was the most powerful and developed countries that decided to take a step forward and try to govern safety at sea. The countries that created the agreement were: Australia, Belgium, Canada, Denmark, Spain, the Irish Free State, the United Kingdom of Great Britain and Northern Ireland, India, Italy, Japan, Norway, the Netherlands, Sweden, and the Union of Socialist Soviet Republics. They all agreed on principles and rules that ships should comply with.

It is very important to understand that the countries that are part of and accept the treaty, undertake to enforce all the regulations that appear to all the ships that sail under their flag. The agreement is made up of several chapters. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.1.1 SOLAS Chapter II: Construction

The measures taken will have a real effect on the new passenger ships that make international trips. It will be up to the administration to determine the necessary safety measures for passenger ships that were already in operation before the agreement came into force. Ships must now be subdivided efficiently taking into account the nature of their services and the length. They should be fitted with water fight in their bulkheads. There are also new rules that require vessels to build a "double bottom" depending on their size. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.1.2 Chapter III: Live-saving appliances

A distinction is made between two classes of ships, class I and class II. Regarding the lifeboats and buoyant apparatus it is commented that they must be correctly prepared and available in case of emergency. In addition, the operations of loading passengers and trimming them to the sea must be done in a reasonable time and without the help of other vessels. As said before, 25% more lifeboat seats are required than the number of passengers on board, at least on international trips.

All new passenger ships must have an approved lifejacket for each person on board. In addition, the main way to lifeboats should be illuminated correctly. And there must be a responsible crew member in each of the boats that knows the procedure and with the corresponding certificate in force. Each vessel is required to have an emergency plan explaining and every crew member should know their tasks, and where they have to go. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.1.3 Chapter IV: Radiotelegraphy:

This chapter refers to all ships that make international voyages except cargo ships that have less than 1,600 gross weight. All of them must carry a radiotelegraphy installation. The installation must comply with the requirements that each country requests and also carry an emergency installation in case the first fails. As a general rule, it should have a transmission range of approximately 100 nautical miles, in which the voice should be received clearly. Vessels with more than 3000 gross tons must include a qualified operator to control during the voyage. The certificate can be given by the corresponding government, but first, the vessel must prove that is in good conditions and complies with all the requirements. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.1.4 Chapter V: Safety of Navigation

Ships that encounter ice masses, tornadoes, navigation hazards must notify the authorities. These will take the appropriate measures to inform the ships that are in the vicinity. Governments will also be responsible for reporting dangerous weather situations and will send daily weather forecasts.
The governments will study possible routes in the north near the arctic and will inform about the current state of the ice and if it is possible to navigate.
The captain of a vessel in case of receiving a distress call from another vessel should always go to the ship that needs assistance except on occasion. In addition, you should try to contact the ship that has problems and repeat the distress message so that other vessels or competent authorities can receive it. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.1.5 Chapter VI: Certificates:

The ships that are within the regulations of the previous chapters will be required to have the certificates of: security, radiotelegraphy and exemption. It will be in the hands of the government to check and inspect that the certificates are in force. Certificates must be renewed at most every 12 years. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.1.6 Chapter VII: General Provisions

If an administration accepts a new regulation, they must communicate it to the others. This agreement replaces the first agreements approved in 1914 for safety at sea. It leaves the possibility of being able to change the part of the conventions as long as one third of the actual countries want it. Then declare they should meet. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.1.7 Chapter VIII: Final provisions

This chapter deals with the way in which regulations affect those parts of the world that are colonies of countries that ratify the agreement. It also talks about the procedure to follow when a new country wishes to accede to this agreement and the day of the entry into force of the agreement, on July 1, 1931. (London 1929. Treaty Series No. 34 (1932) International Convention for the Safety of Life at Sea)

4.2 International Convention for the Safety of Life at Sea 1948

In the year 1948 there was a meeting in London on June 10. After practically 20 years of the approval of the last agreement, it was decided to update it. It was then when several countries proposed the idea of creating an international body to regulate the maritime sector. Although it was not until several years later when the IMO really began to act. Lots of new countries were in the new meeting. They all established a common agreement with uniform principles and rules. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

All the countries that ratified the SOLAS 1948 had to take all the necessary measures to enforce all the laws, decrees and regulations that were established in the convention. They must be applied to ships that carry the flag of the Contracting Governments.

In this agreement, a series of rules that previously were not very clear are adjusted. Some of them related to the live saving appliances, the design of the ship and the correspondent certificates in force. It is also allowed to make some exceptions as long as they are justified. For example: It is allowed to exceed the maximum number of people on board established by a government if, you need to move them from one country to other, because their life is in danger. It is clarified that in house of contradiction with previous agreements the regulation of this will prevail over the others. Likewise, vessels that are not affected by this agreement must abide by the agreements that were already in force. As a novelty, governments are allowed to create new agreements and new rules as long as they previously communicate with the Organization to inform all the governments that are part of it. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

The present agreement is also divided into six different chapters. The main differences and novelties established in each agreement, will be analysed. The

SOLAS of 1948 obviously tries to improve the previous SOLAS by implementing new regulations for all ships that are in international traffic. The chapters would be the following:

4.2.1 Chapter I: General Provisions

The SOLAS 1948 will not apply unless otherwise stated to warships, cargo ships that have a tonnage less than 500 gross tons, and ships that are not mechanically propelled, old ships built, yachts of recreation and fishing vessels.

In passenger ships, the following specifications are established:

1. The ship is checked before its first trip. Inspecting structures, machinery and equipment to verify that they comply with the regulations and are in a correct state.

2. Periodic inspections are also carried out to check the status of auxiliary motors, radios, electrical installations, salvage objects and other equipment.

3. Partial inspections are carried out according to the circumstances after an accident or the ship has some kind of defect.

After carrying out the corresponding inspections, certificates are delivered to the vessel. Depending on the equipment or area of the vessel being inspected, the corresponding certificates will be delivered:

- Safety Certificate: after checking that the vessel complies with the requirements of chapter II, III and IV.
- Safety Radiotelegraphy Certificate: it is delivered after checking that the radiotelegraphy installation complies with the regulations established in chapter IV.
- Safety Equipment Certificate: Obtained after verifying that the ship's equipment complies with the requirements of chapters II and III
- Exemption Certificate: given when the vessel is under the flag of a vessel and therefore it is understood that complies with these regulations

The government of which the ship is flagged is responsible for issuing the certificates assuming full responsibility. Generally, the certificates must be renewed once every year. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

4.2.2 Chapter II. Construction

The way to calculate the "floodable length" and the permeability of the ships is defined. Once again, a series of subdivisions is required in the vessels, depending on the length of the vessel and the type of service that the vessel is destined to carry out. The regulations seem to be much more specific, clearly distinguishing the manner in which subdivisions should be built on each vessel. Putting particular examples. In addition, the double fund is obliged to build more ships.

Vessels are required to have an effective system of pipes that allows, for example, to draw water from a warehouse to leave it empty. Passenger ships are always required to have the necessary electrical power to guarantee the safety of the crew and passengers in case of emergency. Ships must also be equipped with an automatic fire detection system and with a system of pipes and valves that allows extinguishing the fire in any part of the ship. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

4.2.3 Chapter III: Life Saving Appliances

All lifeboats and floating devices must be readily available in case of emergency. New regulations refer to the size and capacity of lifeboats. The administration must impose a maximum number of passengers on board following a formula. (Divide the cubic space by 10). It also specifies the minimum and necessary equipment that must be carried on board the lifeboats. As in the previous agreement, you are obliged to carry at least one lifejacket (approved

by the Administration) for each person on board. Different procedures and requirements are distinguished depending on whether it is a passenger ship or a merchant ship. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

4.2.4 Chapter IV. Radiotelegraphy and Radiotelephony

It stipulates that passenger ships and merchant ships of more than 1,600 gross weight and less than 500 must be equipped with radiotelegraphy and radiotelephone. The radiotelegraphy must be equipped with an auto-alarm.
The radiotelephone station should be located on the bridge and have another emergency facility. It also talks about the characteristics that should be met as minimum power required or minimum listening range. He is obliged to carry a specific type of radio in the lifeboats. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

4.2.5 Chapter V. Safety of Navigation

It is obliged to inform by means of a message to the captain of the ship of any type of danger (ice, hurricanes, storms ...) that has been found during navigation. Governments commit to keeping vessels within their range informed of weather conditions. We can also find the procedure to follow in case of distress message and the different possibilities that the captain can act. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

4.2.6 Chapter VI. Carriage of grans and dangerous goods

During the loading of grain into the vessel precautions must be taken, in addition to the compartment where it will be stored must comply with a series of requirements. The transport of dangerous goods that do not comply with the regulations of this chapter is prohibited. Dangerous goods are understood as the following elements: Explosives, compressed liquids and dissolved gases,

corrosive, poisonous, flammable, substances that become dangerous in contact with air or water, oxidizing agents, spontaneous combustion substances and any type of substance that may present some kind of danger. (London, 1948. Treaty Series No. 1 (1953) International Convention for the Safety of Life at Sea)

4.3 International Convention for the Safety of Life at Sea, 1960

In 1960 a conference was held, this time attended by delegates from 55 countries, a very considerable increase over the previous conferences. It was also the first one held by the IMO. This agreement, like the previous one, presents improvements in supervision, prescriptions for some recognition and certificates for cargo ships of greater tonnage than 300 tons dedicated. Many of the rules that previously only applied to passenger ships now also apply to cargo ships. The measures relating to radiocommunications are revised and improved. In addition, the conference finally approved some 56 resolutions in which IMO was requested to conduct studies, compile and distribute information to adopt new measures. During the following years and until the creation of the new agreement in 1974, several amendments were approved.

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As up to now, the countries that ratify the agreement commit themselves to enforce the legislation in the ships that fly their flag, in addition the 1948 agreement is repealed by this new one. One month will be left open to allow countries that want to accept it. (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.1 Chapter I. General Provisions

Again, the agreement will only apply unless otherwise stated to the vessels that make international trips. Passenger ships must undergo initial tests during their construction, in addition to periodic tests every year and random inspections. Lifeboats and other equipment on the vessel should be checked or

changed every 24 months. In addition to the existing certificates already in the previous agreement, new ones appear: Passenger ship safety certificate

- Cargo ship safety construction certification
- Cargo ship safety equipment certificate
- Cargo ship safety radiotelegraphy certificate
- Exemption certificate

All of them must be administered by the corresponding administration assuming of course all the responsibility and renewed at the most every 24 months. Each administration is responsible for investigating accidents that occur on their ships. (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.2 Chapter II. Construction

Applied only to new ships, in the case that there were old ships should as far as possible adapt to the new regulations as much as possible. To establish the floodable length, ships that have a continuous bulkhead are differentiated from those that do not, so a series of calculations must be made depending on the type of ship. There are also many examples of how to make subdivisions on ships.

Electrical installations on passenger ships that are considered basic to maintain safety on board the ship must consist of auxiliary electrical energy. So that in case of failure of the general equipment the ship can continue its way safely. This auxiliary equipment must be able to provide the necessary energy.

Regarding the fire protection of ships, a distinction is made between ships that transport less than 36 passengers, ships that transport more than 36 and merchant ships of 4000 or more gross tonnage. They can be prevented with three methods: building internal divisions, installing an automatic alarm system or subdividing the vessel vertically. Cargo ships are required to have a pipe system only for the extinction of fires and clear and multiple-way passage ships to lifeboats. (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.3 Chapter III. Life-saving appliances

Again, the devices used in case of emergency should be quickly available. In addition, depending on the size and capacity of the lifeboats they must be equipped with different engines and their capacity will be calculated according to the Stirling rule. Lifeboats propelled by an engine must have sufficient fuel to navigate 24 hours continuously and the necessary equipment required by Regulation 11. Administrations should as far as possible ensure that the crew knows how to use all the elements of rescue. And on passenger ships, a life boatman certificate must be available. (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.4 Chapter IV. Radiotelegraphy and Radiotelephony

All passenger ships and cargo ships of more than 1,600 gross tons must be equipped with a radiotelegraph station that complies with the minimum regulations. Vessels between 300 and 1600 gross weight and which do not have a radiotelegraph station must be equipped with a radiotelephone station.
Ships must carry a radio officer otherwise the radiotelegraphy should has a self-alarm. In the same way it will be necessary that someone on board has the certificate for radiotelephony and is in continuous listening. As in the 1948 convention, a series of requirements are stipulated that the two stations must comply (position, power, alarms ...). (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.5 Chapter V. Safety of Navigation

It is again obliged to report on possible dangers sighted at sea so that the corresponding administration takes the necessary measures. The use of emergency messages for situations that do not require it is totally prohibited. Upon receiving a distress message, you must advance at full speed to the place.

Also try to contact the corresponding administration and the ship that is in danger. (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.6 Chapter VI. Carriage of Grain

Grain load means the following products: wheat, maize, oats, rye, barley, rice, pulses and seats. Occasionally the compartment should be divided with longitudinal bulkheads. A stability loading plan approved by the Administration is normally delivered to the captain.
(London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.7 Chapter VII. Carriage of dangerous goods

The same dangerous goods that were contemplated in the previous agreement require that they are packaged accordingly IMDG code. In addition, containers containing hazardous substances must be prepared to withstand higher temperatures than usual. It is also necessary to register with the technical names and make a description in accordance with Regulation 2. On passenger ships there are maximum permissible explosives charges. (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.3.8 Chapter VIII. Nuclear ships

The construction, inspection and installation of the reactor must be approved by the Administration and take into account the limitations imposed. The possible radiations produced cannot be exposed to passengers, the port, or the sea. The corresponding certificate must be available. (London, 1960. Treaty Series No. 65 (1960) International Convention for the Safety of Life at Sea)

4.4 International Convention for the safety of life at sea, 1974

The SOLAS agreement adopted by a large group of countries did not come into force until May 25, 1980. It is known as an amended agreement, since from then on it is accepted to modify and add amendments to the original agreement. This is what is known as the tactical adaptation procedure. The present agreement contains a series of general regulations, procedures referring to the amendments and other provisions, in addition to an annex divided into 14 chapters. Because the agreement is currently used, we will carry out a more in-depth study of the measures, highlighting the most innovative ones. Also, as far as possible, we will explain the most important amendments that have been applied. Finally, we can name and perhaps understand the future amendments that will be ratified.

The 1974 SOLAS agreement would present the following structure and innovations: (London 1974, International Convention for the Safety of Life at Sea)

4.4.1 Chapter I: General provisions

Specifies the types of vessels to which the agreement applies and the types of document issuance. Passenger and merchant shipping vessels must undergo inspections before being launched and during their service at least once a year. Foreign ships calling at their ports must have the corresponding certificates in force. The corresponding official responsible for reviewing the certificates and the correct condition of the vessel may take measures to ensure that the ship does not leave the port. Measures adopted if the ship poses a real danger to the safety of passengers, crew, sea or the ship itself. (London 1974, International Convention for the Safety of Life at Sea)

4.4.2 Chapter II. Construction

A series of changes are made regarding the scope of fire safety. The ship must be constructed in such a way that if the hull suffers a breakdown, it remains

afloat in equilibrium position. The purpose of electrical and machine installations is to maintain safety on board. Due to the fires suffered by passenger ships in the early sixties, they are obliged to take a series of measures: Make restricted use of combustible materials, total protection in the means of evacuation and access to combat the fires. (London 1974, International Convention for the Safety of Life at Sea)

4.4.3 Chapter III. Life saving devices

Construction specifications, methods for determining their capacity and provisions for maintenance are described.
(London 1974, International Convention for the Safety of Life at Sea)

4.4.4 Chapter IV. Radiotelegraphy and Radiotelephony

It refers to the type of radio installations that have to be carried on board and the listening devices. We can also find the radiotelegraph installations that motor lifeboats must carry. (London 1974, International Convention for the Safety of Life at Sea)

4.4.5 Chapter V. Safety of Navigation

This part of the agreement deals mainly with the operational character and is applicable to practically any vessel that has a certain size. It also includes the maintenance of meteorological services for all ships, the monitoring of ice and maritime traffic and the provision of search and rescue services. Lastly, the Contracting Governments are obliged to adopt measures to guarantee that the ships carry the sufficient and competent manpower necessary to guarantee safety. (London 1974, International Convention for the Safety of Life at Sea)

4.4.6 Chapter VI. Grain Transportation:

The transport of grain has a separate chapter due to the inherent characteristic that it possesses. The shift of grain during transport can have devastating effects on the stability of the ship, therefore measures are included in the way in which the grain must be stowed. Reference is also made to ships specially constructed for the transport of grain and the way in which to calculate the unfavourable heeling moment. (London 1974, International Convention for the Safety of Life at Sea)

4.4.7 Chapter VII. Transport of dangerous goods:

It talks about the classification, packing and stowage of dangerous substances. It has a slight resemblance to the method used by the United Nations, although those of the IMO are much more rigorous. In addition, vessels carrying dangerous goods are required to publish detailed instructions. In addition, each year new hazardous substances are added to the list. (London 1974, International Convention for the Safety of Life at Sea)

4.4.8 Chapter VII. Nuclear ships

A separate document has been drafted for the safety on board nuclear ships and all recommendations on the use of ports by nuclear merchant ships. (London 1974, International Convention for the Safety of Life at Sea)

5 COMPARISON OF CONVENTIONS:

As mentioned above, SOLAS is probably the most important agreement related to safety in the maritime sector. I have analysed the agreements of 1914, 1929, 1948 and 1960, conducting a thorough study. After summarizing all the chapters that form the agreements we can go on to point out the main differences and novelties that each one contributes.

5.1 SOLAS 1914:

The 1914 agreement was mainly concerned with protecting human life on board the ship. Because airplanes did not yet exist, shipping was treated with all the existing passenger flow. When there was an accident on one of these passenger ships, many lives were lost. The average number of fatalities due to maritime accidents at the beginning of the 20th century was around 700/800. Mainly this Convention introduced new international measures on merchant ships: provision of fire resistant bulkheads. It was also obliged to have rescue and fire prevention and extinguishing devices on passenger ships. It also involves the installation of radiotelegraphy equipment on ships carrying more than 50 people and establishing a team to continuously monitor the ice in the North Atlantic. (Led 1998, 1)

5.2 SOLAS 1929:

In 1929, another conference was held in London. The 1914 convention theoretically had to come into force in July 1915, but by then the First World War had already broken out and it could not be done. In any case, many nations adopted various provisions. The conference of 1929 that basically conformed to the same model of the previous version added some new rules. One of the annexes included a revision of international regulations to prevent collisions. (Led 1998, 2)

5.3 SOLAS 1948

By 1948, the technical advances that had taken place throughout the world made the 1929 Convention totally antiquated. London was again the venue for this third meeting. The previous Convention model was used as the basis, but more ships were included and the rules were now much more detailed. Important issues related to watertight compartmentalization, stability rules, maintenance of essential services in case of emergency and the three methods discussed above for fire prevention were improved. A certificate was introduced for those vessels that had a tonnage greater than 500 tons. The rules referring to the Collision Regulations and safety to navigation were revised. In addition, regulations regarding meteorology and ice monitoring were improved. Advances in radiocommunications had been considerable since 1929 and were also noted. Also, in 1948 it was when the International Maritime Organization was created. An international body was empowered to permanently approve and review legislation pertaining to maritime safety. Even so, it was not until 1959 when the first meeting was held. (Led 1998, 2)

5.4 SOLAS 1960

The SOLAS agreement of 1960 was the first held by the IMO, although only 12 years had passed since the previous convention, the pace of technical evolution was accelerating considerably. In the same way as the previous agreement, relative provisions were included in the supervision of the ships as periodic inspections so that they comply with recognitions and certificates in those ships that are engaged in international travel. Previous security measures that only applied to passenger ships now also apply to merchant ships. Many of the radio communications measures are reviewed and vessels carrying life rafts are required to do so. Reference is also made to the transport of grain and dangerous goods. Finally, a chapter is devoted to nuclear ships, since it seemed that they were going to acquire a certain importance in the coming ships. Approved 56 resolutions, many of which urge the IMO to conduct studies, collect and distribute information defining what would be the work of IMO in the following years.

Efforts were made to keep the Convention updated through amendments. Namely, six different amendments were approved in the years: 1966, 1967, 1968, 1969, 1971 and 1973. Unfortunately, the procedure adopted to accept the amendments was not the most appropriate. It required two-thirds of the contracting parties to get the amendments into effect. As the number of Parties to the SOLAS Convention grew steadily, it became increasingly difficult to obtain the necessary ratifications. (Led 1998, 3)

5.5 SOLAS 1974

The SOLAS 1974 agreement is a bet of the IMO in which a new procedure of acceptance of amendments is presented that allows a reasonable time in the entry into force of these. In Article VIII the new procedure can be found. Now adopting a new amendment is easier. It is assumed that the Contracting Governments are in favour of the amendment unless they take positive measures to make their objections known. It is therefore said that the measures will be adopted within a period not exceeding two years if they are not rejected by a third of the Contracting Governments or by a number of Contracting Governments whose combined merchant fleets represent at least 50% of the gross tonnage of the world merchant fleet. Thanks to this new procedure it is thought that this should be the last SOLAS agreement, since through the approval of new amendments the agreement can be updated. (Led 1998, 5)

6 AMENDMENTS

1978: Because the 1974 SOLAS Convention had not yet entered into force, it was decided to adopt this protocol which would come into force six months after fifteen States whose combined merchant fleets represented at least 50% of the gross tonnage. The main measures adopted in the protocol would be the following: (Website IMO)

1. New oil tankers carrying deadweight oil over 20,000 tons are required to carry an inert gas system.
2. Some exceptions can be made when the installation of the inert gas system is not reasonable, but whenever you want to carry out a crude washing procedure you should have one.
3. Vessels with a gross tonnage between 1,600 and 10,000 must be equipped with a radar. Those vessels that have a gross tonnage exceeding 10,000 tons must have at least two radars.
4. For ships of more than 10000 gross tonnage, the steering system must be provided with two or more identical servomotors.
5. Important rules were approved to improve and facilitate the recognition and certification of ships. Improvement measures to control the condition of the vessel, the case, machinery and equipment.

1981: In this amendment, the most relevant measures are found in chapter II, referring to the construction and prevention and detection of fires. Collision bulkheads are checked on cargo ships. Regarding fire extinguishing systems, a new rule has been drafted on inert gas that causes a reordering of the chapter. To improve safety on board, new equipment is introduced: gyrocompass, magnetic compass, radar installations, and pointing aids, devices to regulate speed and distance, indicators to check the rudder angle, radio direction finders. Finally, some aspect related to rescue devices, radiotelegraphy and radiotelephony was reviewed.

1983: The amendment entered into force on July 1, 1986. One of the most important aspects modified in the chapter is the location and separation of spaces in tankers. Chapter III places special emphasis on the detection and rescue of survivors and security conditions. Vests with lights and sounds, cold protective suits to avoid hypothermia. Virtually all lifeboats on merchant ships must be closed and have an engine. Chemical and petroleum tankers must carry lifeboats with an autonomous air supply system, and they must also offer

fire protection for a period of eight minutes (when the cargo they carry is flammable). Survival craft must be able to go to sea with a list of 20º, before it was 15º.

1988 (April): In March 1987 a passenger ship and vehicles sank, the accident caused the death of 193 people. The IMO then decided to approve emergency measures. The amendment affects the integrity of the hull and the superstructure. It also stipulates that vessels have control means to detect water inflows.

1988 (October): also related to the sinking of the Herald of Free Enterprise. The most important rule refers to rule 8 and is designed to improve the stability of passenger ships after breakdown. Vessels are also obliged to have clearly marked draft scales. In 1988, the Global Maritime Distress and Safety System (GMDSS) was also approved in order to facilitate ship rescue and communication operations.

1989: the CSM approved a series of amendments. The most important refers to rule 15, which deals with the opening in the watertight bulkheads of passenger ships.

1990: New ways to calculate compartments and stability on cargo ships over 100 meters. In addition, it is requested to reinforce the prow of the ships, since it is the part that more damages or faults suffer.

1991: Chapter VI that referred to the transport of grain was extended, now covers other types of cargo. Liquids and gases in bulk are not included. The International Code for the Transport of Grain that deals with the security in the stowage must be fulfilled, the others have a character of recommendation.

1992 (April): more stringent fire safety measures for existing passenger ships. Some of them are the followings, smoke detectors and alarm systems. This package of new amendments also applies to ships already built.

1992 (December): The new package of amendments refers to the construction of tankers and some type of equipment such as fire pumps. They also talk about the access and spaces located in the cargo area of oil tankers. New

measures in the CIQ Code are implemented. These affects to the breathing and degassing inside of the cargo tanks.

1994: new modifications were approved by the Maritime Safety Committee. The changes introduced were large and included three new chapters to the Convention.

1. Chapter IX: Management of the safety of ships, to make the International Code of Safety Management mandatory. Whoever assumes the operation of the ship is responsible for security management.
2. Chapter X: Safety measures applicable to high-speed craft.
3. Chapter XI: Special measures to increase maritime safety.

1995 (May): The IMO is recognized as the only Organization responsible for organizing traffic.

1995 (November): Due to the accident with Estonia in which 850 people lost their lives, the IMO decided to approve new important measures related to the safety of ro-ro vessels.

1996 (June): Thanks to the technical innovations of the last years, the chapter III that deals with the devices and means of salvation; It updates. The parts referring to the loading, unloading and stowage of the cargo are also reviewed.

1996 (December): The amendments directly affect the International Code of Chemicals and the International Gas Traders Code.

1997 (June): A resolution concerning Maritime Traffic Services is approved. These are responsible, for example, for regulating traffic in the straits with high traffic density.

1997: A new chapter is added to the agreement, number XII; and new rules for bulk carriers are regulated.

1998 (May): Amendments are added in chapter II, on construction and subdivision; in chapter IV, for radio communications; and in chapter VI for the transport of cargo.

1998: The load line regulations are improved, and replace the ones made on 1966. There are a new number of detailed technical requirements and specifications.

2002: Some new regulations concerning about safety of navigation. Boats that don't comply with the new requirements can be detained as regulations 11 says. Here we have some examples about the safety measures:

- The employers should at least have to rest a minimum specified hour, as it's said in regulations 4 to 6 and 8.
- It is not allowed to hire a person under 16 years of age to work on the ship.
- Establish an annual period of vacations for the seafarers.

2003: The Oil Pollution Compensation Limits. There are better systems to compensate and identify for the damage made. This order amends to the Part I of Schedule V, of the 1992 protocol to the CLC.

2004: Come into force the amends of the Convention on Limitation of Liability for Maritime Claims. A change is made on Part II of Schedule VII to the Merchant Shipping; Article 2 is now interpreted in a different way. The article refers about loss of life or personal injury to passengers of seagoing ships.

2006: Another amendment referred to the Oil Pollution. Few definitions are added about "Bunkers Convention" and related expressions. Regulation 5 inserts a totally new section. When any occurrence (contamination) happens while bunkers oils are discharging, the owner is liable for the cost of any measures taken for the purpose of preventing or minimizing the damage.

2012: these regulations are made to support the operations on the liability of passengers by sea in the event of accidents. The ship must have insurance, as Regulation 5 orders; and evidenced by a certificate. Failure to comply with the insurance obligations could result on detain the ship.

2014: related to the carriage of passengers and their luggage. It is required to have at least 250.000 euros for each passenger who travels, because of the new insurances and claims regulations.

2016: the amended schedule incorporates the new higher general limits on claims for loss of life, personal injury and claims, other than passenger claims.[2]

7 IMO FUTURE

We are going to talk now about the oncoming amendments. As we can imagine, IMO is still working on making the maritime sector a safer mode of transport. As long as technologies and knowledge are increasing, new regulations must be made. Future is always something unknown, and that is because why it is necessary to update the currently conventions.

Through the IMO's webpage we can find the forthcoming amendments. Most of them don't have a lot of information since the committees still working in them. We have different categories depending on the topic.

7.1 Crew and Manning

- Safety Measures for Ships Operating in Polar Waters: A completely new chapter is added (XIV). Definitions about polar codes, Antarctic area, arctic waters… Ships should comply with the polar code. The goal of the regulation is providing new designs for structure, machinery and electrical installations.
- Means of Escape: Chapter II-2, Part D, Regulation 13. The main purpose of the new regulation is to avoid possible congestions on the evacuation route. An evaluation in the design should be done before.
- Definitions: Chapter II-2, Part A, Regulation 3. Two definitions are added: "helicopter landing", the area designated for occasional landing helicopters; "winching area", area provided for the transfer by helicopter from the ship.
- Helicopter Facilities: Chapter II-2, Part G, Regulation 18. Ships constructed after 2020 having a helicopter landing shall be provided with the provisions of chapter 17 of the Fire Safety Systems Code.

- Operational Readiness, Maintenance and Inspections: Chapter III, Part B, Regulation 20. These two amendments are directly related about the new inspections of live-saving appliances that might need to pass. Maintenance, examination and operational tests to: launching appliances, life boat and rescue boat and the davit-launched life raft automatic. (Website IMO Resolutions)

7.2 Fire-Fighting Equipment

- Structural Integrity: Chapter II-2, Part C, Regulation 11. The openings of the tankers that are constructed after 1 January 2017 shall be arranged in accordance with regulation 4.5.3.4.1. In addition, is added that the secondary means shall be capable of preventing over-pressure with the means of isolation required in regulation 4.5.3.2.2.
- Protection of vehicle, special category and Ro-Ro Spaces: Chapter II-2, Part G, Regulation 20. This amendment refers to the performance of the ventilation systems. In the passenger ships, the ventilation system should be separate from other ventilation systems and shall be capable of being controlled somewhere outside such spaces. In cargo ships, ventilation system shall be run continuously and give at least the minimum air changes required in paragraph 3.1.1. (Website IMO Resolutions)

7.3 Gas

- Ship Arrangement: Chapter 3. Referred to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. A paragraph is replaced (3.2.5). Windows and side scuttles facing the cargo area shall be now constructed to “A-60” class. First floor of tiers in the superstructure shall be of fixed type. (Website IMO Resolutions)

7.4 General

- In 1st January of 2019, IMO will approve new rules about MARPOL convention. Both related to the discharge of garbage in the outside and within special areas.
- In 1st January of 2020 a new paragraph will be add in the International Code on Intact Stability made in 2008. It refers about the ships engaged in anchor which are handling operations and the information they must give. (Website IMO Resolutions)

7.5 Pollution

- International Code for Fire Safety Systems: Chapter 8. Any part of the system shall be suitably protected against freezing. It also refers to the quality of the water provided by the manufacturer. The main reason of these controls, is to prevent the internal corrosion of sprinklers. (Web-site IMO Resolutions)

8 CONCLUSIONS

After several months working on my thesis I have learnt lots of news things and in some way, I have changed my point of view about how the marine world works. I have read books related to the topic and did a deeply search in the World Wide Web. I have done many courses in my carrier associated with the SOLAS convention, but the truth is; we just memorized some important articles for passing the exam. Something you will completely forget a few weeks later. In my opinion, this is not really useful. By reading the convention and trying to understand the reasons of every new article and measures the level of compression will increase tremendously. There is a big difference between remember something and understand it.

About the conventions I explained, we can take some ideas. First, and as it is written in the “Comparison of Conventions” section; the main reasons why each of it was made. And second, the real necessity to be constantly refreshing and updating the agreements. Even we still have some accidents nowadays, we have reduced them considerably. However, it looks really hard to end with all the incidents. The principal reason is because of us. We humans are the first cause of all the accidents around the world. A report made by the Allianz Company said that, the human factor causes around 75% of the accidents. Although we could create all the legislation we want, that is something we are not going to eliminate. Because we are not super heroes, we are going to make some mistakes. IMO’s job passes through prevent and minimize these possible errors we can make. (Rodrigo, Seguridad Marítima, 10-15).

It is pretty clear the way that safety at sea is taking towards the future. Working with machines and computers is becoming more often, because they are more efficient and secure than people. We do not have to be really smart to observe that crews are becoming smaller. Replacing the job that sailors used to do by installing new technologies, should reduce the number of catastrophes. The regulations approved over the last years pursue this goal. Every new convention is working some way in substitute the old methods by introducing the modern ones. The actual tendency is to build gigantic ships, so that makes the system pretty complex. The responsibility with regard to marine safety is now bigger since the capacity of the vessels are certainly increased. A fatal accident in one of these gigantic ships could end with thousands of lives or millions of cargo tones. Safety takes a really important role in maritime sector. Thanks to the obligatory use of the GPS and the Electronic Chart Display and Information Systems (ECDIS) it is easier to locate a vessel. Nowadays we have the Automatic Identification System (AIS), that makes possible to identify and follow the route of a particular ship.

As we already saw, it exists three different ways to check that the ship is in good conditions.

1. Own government control. The State controls their own fleet and all the certificates that has a direct effect.
2. The port state control. Thanks to the international law, it is possible to make random inspections.
3. Classification societies. Private companies that make sure that the vessel is in good conditions.

After the Titanic accident, leader countries understood the necessity of creating several rules that ships must comply with. At the beginning rules were really basic, nowadays we have lots of specific and strict precepts. The final result is what we have today. A really secure and almost perfect control of the maritime traffic. Since the ships make international trips to engage in commercial activities, international regulations are required too. This may sound obvious, but is actually one of the only kind of works that use this method. Practically all the decisions are taken at global levels. This is a really important advantage because it makes things easier for everyone. Imagine for a moment a world where every country has his own regulation so you need to adapt your ship depending your final destination. That could be crazy… Economics, politics, migration, pollution measures are made at national levels. Every State has different standards. This is one of the main reasons we are not being capable to face all these problems. Instead of working together and think about possible solutions that benefit to all of us, countries are just interested on making profit to themselves.

So, what I have learnt doing the Thesis is how the maritime world is one step ahead of many others sectors. Leaving a side personal and national interests, they have been capable to build a complex system that regulates all the ships navigating in the world. IMO has been working more than 50 years since it was created. All the members are represented in the assembly, and they have the right to vote no to the new amendments. But if the amendment is accepted and incorporated to the convention the State will have to make sure all their fleet satisfy with it. In my opinion, it would be interesting to bring this work method to many other sectors. I really think it could help us to organize and work in a more properly way. Frontiers between countries are just barriers, we all have different nationalities, but as human beings that we are; we all want the same things.

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